# LUBRICATION

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We invite correspondence from all those interested.

Those who fail to receive LUBRICATION promptly, will please notify us at once and will confer a favor by promptly reporting change of address.

## FOREWORD

The article by our Mr. O. J. May on the next page is of considerable interest from the standpoint of the character of the installation and the close connection which Mr. May has had with its development for some years.

In passing, it might also be mentioned that Mr. May, in addition to his specializing on lubricating problems, is a trained engineer, and from this it can be seen that his paper is fully authoritative.

While by no means the largest installation of its kind, the power plant of the Sanitary District of Chicago possesses features of interest to all engineers.

As is widely known, the drainage canal from which this power plant receives its head of water, was not intended for a water-power development. It was constructed to divert the sewage of the city of Chicago and to safeguard the lake front.

The mere idea of utilizing a polluted drainage canal to produce power for the lighting of homes and for turning the wheels of commerce, is sufficient to suggest the care of natural resources usually associated with European rather than native practice.

The character of the water, while having little effect upon the design of the turbines, does influence the operating conditions notably by increasing the difficulty of protecting and lubricating the submerged parts. Before Texaco Crater Compound was used on the submerged bearings and shafts, not only was lubrication almost impossible, but the acid of the decomposed sewage had a highly corrosive effect on the metal. With the application of Crater, these conditions were relieved and a degree of lubrication and protection was attained which more than a little surprised those who were not familiar with the characteristics of this unusual lubricant and preservative.

We have the Superintendent's word for it that before Crater was used many of these parts were obliged to remain unlubricated as the water washed off all other products and the organic acids soon destroyed them. Furthermore, this installation and our handling of the entire lubrication of it furnished a good example of the work done in all parts of this country by the combination of Texaco Lubricants and Texaco Service. The same degree of efficiency and the same ability to supply the right oil for any place is exhibited in our dealings with some of the largest manufacturing plants, iron and steel works, central stations, cement mills, lumber mills, cotton mills, and so on down an endless list. Our engineers are ready at all times to go into any plant of any kind and with their experience and their knowledge of oils and their uses, make a thorough investigation of the various mechanical conditions, after which they will make recommendations for lubricating which cannot fail to reduce power costs, repair charges, and oil consumption.

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On page 9 we print a letter from salesman Craig to "Uncle Bill," his district superintendent. Both "Uncle Bill" and Salesman Craig will get quite a surprise when they see this letter printed in "Lubrication," for it was never intended for this purpose, being written merely in answer to a request for more information from the district office. This enthusiastic bubbling over is characteristic of a Texaco salesman when he talks about Texaco Crater Compound.

The editor happened to see this letter by accident, and we think you will agree with us that it is well worth printing, both for the real human touch it contains, and the very good moral at the end of it.

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Have you received your copy of the Crater Book? If not, let us know with your exact address and we will send you one by the next mail.

# EFFICIENT HYDRO ELECTRIC PLANT LUBRICATION

Sanitary District of Chicago Power House, Lockport, Ill.
By O. J. MAY
Chief Lubrication Engineer, Chicago District, The Texas Company

The Sanitary District of Chicago was organized under the general law for the creation of sanitary districts, enacted by the Illinois Legislature in 1889.

The primary object of the work undertaken by the Sanitary District was the protection of Lake Michigan (the great reservoir from which the City of Chicago and its urban and suburban neighbors draw their drinking water) from sewage pollution due to the discharge directly into it, or into the rivers which empty into it, of the sewage of the City of Chicago and its aforesaid neighbors.

A great canal was constructed from Chicago (Robey Street) to a point 4.3 miles south of Lockport, Illinois, a total of 32.35 miles, and at this terminal site the Hydro-Electric Power Plant was located. Equipment was installed to utilize the 600,000 cubic feet of water per minute, which was necessary to keep the flow of sewage towards the Illinois river, or in other words from backing into Lake Michigan.

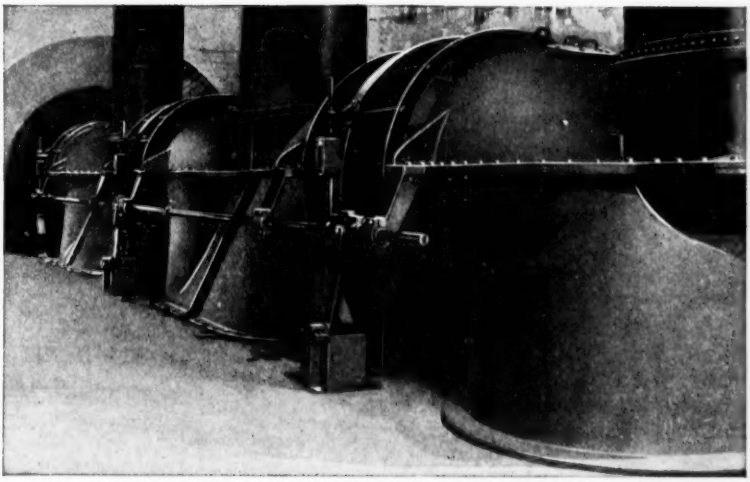
The controlling works, located at Lockport, 4.3 miles north of the power plant, comprise seven sluice gates, considered a modification of the stony-gate type. The gates have a vertical travel of twenty feet and an opening thirty feet wide. The bear-trap dam is essentially two great leaves hinged together and working between masonry bulkheads, having an opening one hundred and sixty feet and an oscillation of twelve feet. This dam is raised or lowered by altering the elevation of the water under same, and is all controlled by valves.

From the date of the lowering of this bear-trap dam, January 17th, 1900, until August 30th, 1907, the water flowing through the main canal escaped over the dam or through the stony-gate at the controlling works, and a great amount of energy ran to waste.

Through legislative enactments of 1903, work was commenced on the channel from the controlling works to the power house site, whereby an effective head of thirty-four feet was obtained. This channel is of varying width of not less than one hundred and sixty feet. All of the area available was taken into the channel so as to impound water for lockage purposes and thus minimize fluctuations of head due to the taking of water into locks. The structures at this point consist of ice fenders, penstocks, power house, movable bear-trap dam, and a canal lock.

The canal, or tail race, below the power house is three hundred and thirty-six feet wide where the tail water discharges, narrowing at a distance of eight hundred and fifty feet to one hundred and sixty feet, with a minimum depth of 19.7 feet.

The power plant is located on the west side of the channel and the entrance to the forebay is protected by a massive concrete wall carried upon fourteen submerged concrete arches of nineteen feet span, built on a skew. The turbine penstock entrances are



A view of the Horizontal Turbine taken in the Penstock when drained for inspection. Note the film of Texaco Crater Compound around the bearing surfaces on the shaft. This equipment is continually submerged in sewage water.

protected by the usual iron gratings. There are nine turbine penstocks, thirty-two feet wide, seventy feet long, and twenty-eight feet high from floor to intrados of arch, and the concrete walls between them are six feet thick. The central penstock is sub-divided into three sections and devoted to the exciter units, of which there are three. The exciter turbines have thirty-inch Jolly-McCormick runners mounted on a horizontal shaft, two of which were manufactured by the Wellman-Seaver-Morgan Company, and one by the S. Morgan Smith Company. The generator turbines (of which there are seven installed) have six Jolly-McCormick fifty-four inch runners mounted upon a horizontal shaft twelve inches in diameter and 71 feet 5 inches long. This shaft is made in three sections, the outer section is of open-hearth steel, the middle section of nickel steel, and the inner section of nickel steel annealed. This arrangement gives the requisite strength of the sections without increasing the weight of the metal. The speed of the runners is 163.5 R. P. M., developing 5,360 El. H. P. at .8 gate opening on 100,000 cubic feet of water per minute. The shaft of the turbine proper revolves on six oiled bearings, the oil being in constant circulation through a system operated by means of two geared Gould rotary pumps driven from a belt driven jack shaft. The turbine bearings can be inspected from above by means of inspection tubes.

This was the first installation where six turbine runners were mounted on a horizontal shaft.

The draft tubes are of the original construction, moulded in concrete. The bulkheads of the penstocks form the north wall to the power house. The building is seventy feet wide, three hundred and eighty-five feet long and forty-seven feet high; it is built wholly of concrete. This building contains the electrical machinery, exciters, generators, transformers,

switchboard, etc. Two of the exciters were furnished by the Crocker-Wheeler Company and one by the Western Electric Company. They are three hundred and fifty K.W.—D.C. machines, 250 volts, operating at 300 R. P. M. The generators were furnished by the Crocker-Wheeler Company; these are four thousand K. V. A., 6,600 volts, three phase, sixty cycles, operating at 163.55 R. P. M. Both exciters and generators are direct connected to the turbine shafts by suitable couplings, the generator rotors being eighteen feet two inches in diameter.

The pressure is stepped up to 44,000 volts and transmitted to the Western Avenue terminal, or transformer house in Chicago, from which it is stepped down to 12,000 volts and transmitted to the several sub-stations for street lighting purposes. All street lighting of the City of Chicago is taken care of through this plant.

The speed of the generator turbines is controlled by Lombard 60,000 foot pound hydraulic governors: two of the exciter turbines are controlled by Lombard governors, the other one being controlled by a Woodward Mechanical Governor.

Before the introduction of Texaco products at this plant, the question of lubrication was a very serious, as well as costly, problem. This statement is based on the writer's personal experience as superintendent for a period of four years. As previously mentioned, the turbine bearings are lubricated by means of a recirculating sytem. The feed pipes to and from the turbine bearings are submerged in the channel waters and the oil is thus naturally subjected to low temperatures with moisture which is due to the condensation forming on the inner surfaces of the bearing inspection tubes. The effect of the low temperature was the congealing of the oil and stoppage of oil feeds to the turbine bearings, necessitating the removal of the oil and the blowing out of the feed and return piping with air. The second and more serious trouble was that the condensation and oil were agitated by the shaft coupling bolts, causing an emulsion which also necessitated the removal of all the oil and frequent cleaning of the entire recirculating system. This oil was usually in such a state that it was dumped into the tail race. The introduction of Texaco Nabob Oil has entirely eliminated these conditions, as Nabob oil has a zero cold test and does not form an emulsion with water. The use of Nabob Oil shows an approximate saving of 35 per cent in cost, not taking into consideration the labor costs formerly necessary for cleaning the systems. This saving has been increased further by installing a suitable dry type filter, arranged to filter the entire quantity of oil per system as needed. The consumption of Nabob Oil, and that of competitive brands, could not be recorded, due to the loss of oil through the improper sealing of the turbine bearing packing. As previously stated, these turbines are horizontal, having three right and three left discharge or quarter turns through which the shaft passes. It is necessary to have stuffing boxes on each side, in order to maintain oil in the bearing reservoirs. During the operation of the turbine, a seventeen-inch vacuum is created in the quarter turns and draft tubes; and if the packing of these boxes is not tight, there is a considerable loss of oil. Each box requires six rings

of high grade packing, one inch square by three feet long, costing approximately $1.00 per ring. These in the majority of cases, last from but a few weeks to a month. The effect of the water on this packing, due to sewage pollution, was to cause it to become very hard, and in this condition it cut ridges into the shaft proper to a depth, in some cases, of one-quarter inch. Experiments were then carried on, using an untreated hemp or flax packing and thoroughly impregnating same with TEXACO CRATER COMPOUND, with gratifying results. This Crater-impregnated packing not only shows an increased life of 40 per cent, but the excess amount of Crater that is squeezed out during gland drawing fills up the irregular surfaces on the shaft, thus increasing the seal with less gland tension, and reducing the oil loss. The records show that it was necessary to draw up the glands weekly on the former packing, while on Crater-treated packing, the units now operate for months without the glands being adjusted. As yet, no mention can be made of savings on this item; a 40 to 60 per cent saving on cost is looked for, and possibly a saving of 50 per cent on labor. There is also the question of *human life* to consider in this connection, as the *poisonous* gases of the water are *dangerous* and one machinist who was down repacking the glands was pulled out *dead*. In fact, when men go down into the inspection tubes to pack these boxes, air leads are taken down to prevent asphyxiation.

The speed of each hydro-turbine is regulated by a 60,000 foot pound Lombard Hydraulic Governor, using oil under 200 pounds pressure as a power medium, returning to receiver tanks under 18-inch vacuum. The governor oil problem, prior to the introduction of Texaco Alcaid Oil, was a constant source of worry, as well as an item of considerable expense. The oil furnished by the Lombard Company for the operation of the governors at that time was, as a matter of fact, the only oil that would withstand the severe service necessarily imposed upon it while in use. After four months of service this oil would decompose, causing carbon formations throughout the entire sytem. It was then necessary to remove the relay and floating valves and the strainers practically every day for a thorough cleaning. The gumming or oxidization of the oil was partly overcome by adding a solution of carbonate of soda for neutralization, yet with all this care and treatment the oil showed only AN AVERAGE LIFE OF SIX MONTHS. Then again, it was necessary to circulate a strong solution of carbonate of soda, followed with kerosene in order to remove every trace of deposit before installing a new charge of oil.

Texaco Alcaid Oil has entirely eliminated all of this trouble, and the records today show these systems operating for TWO AND ONE-HALF YEARS ON THE SAME CHARGE OF ALCAID. It is very rare that the governors need attention by way of strainer and valve cleaning with Texaco Alcaid Oil in use.

The following tabulation of results brings out the accomplishments on this Lombard Governor Oil problem. It is well to note that during the use of Alcaid the regulation of the units has always been perfect, which was not the case when the former oils were in service:

**Cost of Oil for Lombard Governors on Basis of Six Months Use**

| | Former Governor Oil | Texaco Alcaid Oil | Reduction | Per Cent |
|---|---|---|---|---|
| Cost of oil for six months | $ 52.50 | $ 8.75 | $ 43.75 | 83.3 |
| Labor for cleaning system, installing and cartage | 15.50 | 5.00 | 10.50 | 67.7 |
| Replenishing Oil | 4.50 | 2.00 | 2.50 | 55.5 |
| Carbonate of soda solution | 2.00 | ..... | 2.00 | 100 |
| Labor for cleaning strainers and valves | 117.00 | 11.70 | 105.30 | 90 |
| Total | $191.50 | $27.45 | $164.05 | 85.7 |

Life of former oil ..... 6 months
Life of Texaco Alcaid Oil ..30 months
Increase life .....24 months or 400%

As usual, Crater Compound has worked wonders at this plant; in fact, perfect lubrication was effected where heretofore no attempts at lubrication were made, as it was considered impossible to obtain a lubricant that would operate on parts submerged in the channel waters. Photo on page 3 shows the general turbine layout in the penstock proper. Crater is being used for lubricating the entire gate mechanism, gate rods, gate operating rod, fulcrum and pins, gate rings, etc. It was also used on the hydraulic ram for operating the head gates. Difficulty was always experienced in lubricating the moving surfaces of these parts until Crater was introduced. It is not unusual to inspect the turbines after operating under water for one year and find Crater intact. In fact, during the year 1913 large numerals were painted on the quarter turns with Crater, and when examined the following year, were found intact—Crater prevented the organic matter of the water from adhering, whereas the remaining metal and concrete surfaces were coated with two inches of slime. This naturally led to the use of Crater as a general protecting medium for all metal under water.

Each penstock has three sets of head gates 30′0″ x 5′2″, three of which have sluice filler gates 3′0″ x 2″. Prior to the use of Crater on the gate mechanism it required THREE MEN on the hand wheel of the governor to open the gates in order to get the unit up to speed so the governor could be put in, whereas, now, with Crater in use, ONE MAN can easily operate the gates. This fact alone brings out very clearly the lubricating merits of Crater when operating under water.

Crater also proved to be a very efficient lubricant for the gears driving the Rotary Gould Oil Pumps. Each turbine is equipped with one pressure and one suction oil pump, being gear driven from a belt driven jack shaft. The former life of these gears was six months at a replacement cost of $10.00, size 6″ x 18″ gear 2″ face. With Crater the life has increased to one year, or a total yearly saving for the 28 sets of gears and pinions of $280.00.

Crater is also being used for the lubrication of all gear trains of the locks. At the controlling works of the Butterfly Dam, Crater Compound has done wonders. This dam resembles a large steel lock gate; it is 184 feet long by 30 feet, 1 inch high. Normally, this dam lies in the center line of the channel so as not to interfere with navigation. In this position its ends are protected by concrete piers, and a fixed bridge extends between the piers to hold the top pivot of the dam. In the dam proper are twelve sluice gate valves, each six feet, four inches long, and four feet, one inch high. These valves are opened and closed through a motor driven common shaft, to which is geared the operating mechanism

of the valves proper; this by means of clutch arrangements. Prior to introducing Crater for the lubrication of these gears, it was customary to replace an average of ten sets of gears and pinions during the winter months, damage being caused by ice formation on the gear teeth, as well as from actual gear wear. The gear is 24″ in diameter, and the pinion 4″, having a 3″ facing, the set costing $12.00. Now, by the use of Crater for lubricating these gears, it is not necessary to replace gears at this point, which shows a yearly saving of $120.00.

From the foregoing, it can readily be seen that exceptional economy and efficiency have been shown through the use of Texaco Products, also it will be quite clear that we have lubricants that will operate under the most severe and exacting conditions. In summarizing the entire proposition of the lubrication of the equipment in this plant, it may be said that it was nothing more than a case of the proper diagnosis of mechanical conditions and the selection and application of exactly the proper lubricant to do what was necessary from a strictly engineering standpoint.

## SUMMARY

(Showing Distribution of Texaco Products Throughout the Plant)

### POWER HOUSE

**Texaco Nabob Oil**

Turbine Circulating System
General Lubrication

**Texaco Alcaid Oil**

Lombard Hydraulic Governor System
Generator Bearings

**Texaco Crater Compound**

Gears: Triple Pump
Governor Racks
Oil Pumps
Hydraulic Rams
Entire Gate Operating Mechanism
Metal Protection
Filler Sluice Gates

### LOCKS

**Texaco Alcaid Oil**

Motor Bearings
Hydraulic Ram System

**Texaco Crater Compound**

Lock Gate Mechanism Gears
Emptying and Filling Mechanism Gears

### CONTROLLING WORKS

**Texaco Alcaid Oil**

Motor Bearings

**Texaco Crater Compound**

Bridge Gears
Butterfly Dam Gears
Bear Trap Dam Gears
Sluice Gates
Metal Protection

# WHEN WE HEAR "DIESEL" WE THINK OF "URSA"

IN our offices and laboratories, we have come to hold these two names as inseparable.

We have been greatly interested in the development and use of the Diesel Engine in this country, and the success of TEXACO URSA OIL as a lubricant for this type of engine has been so consistent and so pronounced that it has commanded the attention of the manufacturers and users of Diesel and heavy oil engines throughout the country.

Besides its excellent lubricating body, there is one point which makes TEXACO URSA OIL unique and of unsurpassed value for the lubrication of the Diesel Engine.

TEXACO URSA OIL takes care of the entire lubricating requirements of the engine. It lubricates the power cylinders, air compressors, and all other parts—one oil for all.

We make oils for all purposes. Each one possessing certain characteristics which make it suitable for a certain purpose. From our wide range, we recommend URSA for Diesels. We recommend it because it is a low flash oil. It burns clean on reaching the combustion chamber. We recommend it because it is of such uniform nature that it will not distill or decompose in the cylinders. It will not gum or form troublesome deposits.

These qualites have shown themselves in practice to be just what is required for the efficient lubrication of the Diesel and all heavy oil engines. These facts have been recognized by the manufacturers of engines of this type, many of whom are at present recommending TEXACO URSA OIL for use on their engines.

Do not hesitate to call on us for further particulars.

## THE TEXAS COMPANY

DEPT. H, 17 BATTERY PLACE, NEW YORK

*Offices in Principal Cities*

# A LETTER TO "UNCLE BILL"

Live Oak, Fla., May 11th, 1916.

THE TEXAS COMPANY
Mr. Wm. Reynolds
Atlanta, Ga.

Dear Uncle Bill:

I am just surviving another balmy Florida day.

The beautiful sun sheds its radiant light on pure white sand and generates a heat, superheat, which incubates 1972576 Sandflies per minute, all being full grown and very friendly at time of birth and willing to go any where on the human anatomy and thrive, so to speak.

It brings to memory the torrid day of August, 1915, in dear old Macon, Ga., when I armed myself with a pail of Crater Compound, a pail of Kerosene and a small brush and sallied forth, not to do battle with the festive Sandfly but merely seeking an opportunity to demonstrate the excellent qualities of Crater Compound.

At the Massé-Felton Lumber Co. plant I met Mr. Rogers, Chief Engineer, and requested an opportunity of bringing old worn out gears back to life. He took me by the hand and said, "Brother, I have a poor old pinion gear in sore distress and ready for the scrap heap and I have just placed an order with the John Schofield Iron Works for a duplicate and requested same to come P. D. Q." I found this pinion to be a thirteen tooth, three inch pitch, six inch face, working on a seventy tooth bevel wheel and pulling the transfer cables which carry the lumber from the trimmer to the sorting shed.

This gear was in very bad condition and ready to go out at any time under the heavy strain so I told Mr. Rogers I would like to prolong the life of this gear sufficiently to prevent his mill closing down before the new pinion was ready for him, and therefore I made a generous application of Crater Compound, after having cleaned the gears with kerosene, removing all traces of grease.

I left the remaining portion of Crater with Mr. Rogers to be applied each day and on the following Monday, I received an order from him for one barrel of Crater Compound.

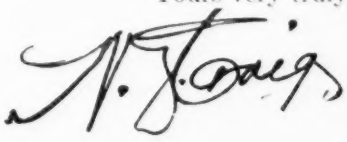
I have called at this plant whenever I visited Macon and was always greeted by the peaceful hum of the old worn-out pinion, still doing business and the new pinion standing over against the wall waiting to relieve its faithful brother.

Now remember, this occurred in August, 1915, and upon my last visit to Massé-Felton Plant, which was March 26, 1916, I was greeted by the same old peaceful hum of the same old worn out gear, well coated with Crater Compound and doing business every day, while the new gear, which was ordered *rush* in August, 1915, was some rusty from just waiting on Crater Compound to give the old gear a chance to die.

Engineer Rogers has composed a little peaceful ditty, which he sings to the peaceful hum of the old, worn out gear, which runs like this:

**"A little Crater now and then**
**Will make 'em run as long again."**

Yours very truly,



## THE SALESMAN'S STORY

It is a comparatively easy matter for a salesman to become enthusiastic over a product such as Crater Compound. The work that Crater is doing both for the Texaco salesman and his friends is well shown in the following report, which is printed verbatim, as received from the man in the field:

"I called on the Superintendent of this plant this morning for the purpose of applying the initial coat of Crater Compound to the gears selected for the test.

"The Superintendent turned me over to the Master Mechanic, with whom I spent practically the whole day in the plant.

"To begin with, they take steel billets, and in the operation of the mill, develop the material into tires for locomotives and passenger car wheels.

"They have three tire and shell mills (the shells for stone crushing machinery), each unit being driven both by hydraulics and electricity. The gears and bearings to be lubricated on the above three mentioned mills are the most difficult points at the plant.

"Each mill is driven by a bevel gear 3′ 0″ in diameter—20 teeth, and doing 120 R. P. M. This is a vertical gear operating a table gear 6′ 0″ in diameter—40 teeth, and doing 60 R. P. M. These two gears operate in a tunnel beneath the mill and have been lubricated (?) in the past with a so called gearshield that seems more tar than anything else. The result has been that these driving gears have been known to wear out within one month. I saw one set just taken out, which was the worst example of worn gears I ever saw, considering only thirty days usage. The teeth of both gears had practically been worn off entirely.

"With the gearshield operating in this underground tunnel, which is a cold place (in addition to being flushed with cold water to keep the bearings cool), it seemed to harden and as the Master Mechanic said 'prevented abrasion for the first revolution of the gears, and after that, either flew off or jammed itself between the teeth of the gears and made matters worse.' The gears also made so much noise that it was deafening.

"I instructed the men to clean off the gears with kerosene and to scrape the teeth, getting the tar off as much as possible, after which we applied some boiling hot Crater Compound, which appeared to take a very good hold on the face of the metal.

"As soon as the engineer began turning the mill over, they noticed, first that the lashing of the gears had ceased and that they made no extra noise. I explained that this was due to the elimination of the former abrasion, and that they were now getting lubrication.

"All the men certainly were pleased, and could immediately notice the way the mill quieted down and ran smoother.

"I also applied Crater on all of their big bearings, which operated under heat and they were surprised to note the improvement over the previous results with some cheap cylinder oil.

"They have several hydraulic systems of 25,000 pounds pressure, and I instructed them in the use of Crater for the accumulators and plunger rods. We made initial applications, and in one particular

case where an accumulator leaked badly, they were very much surprised and pleased when I explained that as soon as they took some new hemp packing and soaked it in boiling hot Crater before putting the packing in, that it would undoubtedly take up all the leakage, even though the plunger was badly scored.

"They also had a No. 8 Brownell crane and a No. 8 Brownell shovel which afforded a grand opportunity for Crater to make a showing on the table gears, and the Master Mechanic instructed the crane man to apply Crater to this equipment in the exact manner I prescribed.

"Fifty pounds of Crater in a steel plant like this one that had every gear and bearing hungry for a coat of Crater (apparently thousands of places), was about as much as a molecule compared to the ocean.

"The Superintendent and the Master Mechanic got together with me to hear my final remarks before leaving, and I told them that in view of the small sample we were working with, about the time Crater got down to the metal and began to make a showing we would run out of Crater and have to go back to the tar product and undo the results of our labor.

"They both were in a very receptive mood, and certainly appreciated the apparent results in the face of an initial application.

"I asked for permission to ship a barrel of Crater immediately so it would get to the plant before the 50 pounds were used up, but the Superintendent said they would have to take it up with their New York Office.

"It happened that their Vice-President was at the plant the same time I was, and as I am positive of the success of the test, I said that if they would order a barrel at once so I could ship it from Chicago while their order was being transmitted to New York and back to us again, that I would take the responsibility of guaranteeing that in the event of our test being a failure we would cancel the charge for the barrel of Crater. The Superintendent said that was certainly a fair proposition and asked me to wait until he went back to the office and conferred with the Vice-President. He later called me up on the 'phone and said they accepted my proposition and for me to get the barrel on the job and their formal order was being sent through tonight confirming our understanding.

"I accordingly got Mr. Jernegan on the long distance 'phone and ordered a barrel of Crater out today sure, so it would be here by Friday.

"On my way out of the plant I passed some monstrous lathes used in turning down the tires, and the big gears were making a terrible noise, some cheap red oil, 200 viscosity or under, being used. I pointed out where one application of Crater would suffice for at least a day and also eliminate the metal abrasion, stopping the terrible noise, for there were about 50 machines and I could hardly hear myself yell.

"On the whole, I don't want to say too much and then fall down, but this plant appears to be a perfect prospect for Crater Compound, and I can also see where several recommendations I made on their general lubrication of the plant and engines pleased them and feel as though I certainly accomplished a great deal today toward adding another good plant to my list of customers.

"The Superintendent and the

Master Mechanic (in particular) were exceptionally courteous to me and gave absolute free reign to all of my suggestions, and I hope that after the test is concluded that you will write the Superintendent and thank him personally for his efforts in assisting me.

"I have made arrangements to be at the plant again next Friday when the barrel of Crater should be on hand, and I will try not to overlook any place where Crater can be used, even to the door knob where it will be the last thing they will think of when the men go home."

(Signed) S. S. JACKMAN

Chicago, May 5, 1916.

The following will finish the above report:

"I called on the Master Mechanic today and he was certainly very courteous and agreeable. He took me out to the mill where our Crater Compound test had been run for nine days. The Crater Compound had penetrated to the face of the metal and the gears were in good shape.

"We went down into the tunnel while the mills were all working, turning out tires.

"At the time of my call, the gears had been under constant operation about five hours with one application of Crater Compound. Some of the teeth were very bright in contrast to their appearance when using the tar product (gearshield), but I assured the Master Mechanic that there was a good working film on the surfaces, just the same. During a change of billets, while the gears were idle, the Master Mechanic stepped up and ran his fingers over the bright spots and came back with a good film of Crater Compound on his fingers. He was greatly pleased and surprised, and stated he had no idea Crater would maintain such a film.

"The three mills are working beautifully with Crater on all the gears and bearings, and as I had made four calls in about one week, I signified my intention of turning in my final report on the test, stating that Crater Compound had made good.

"The Master Mechanic said he was more than pleased and would also turn in a report to the new Superintendent to the effect that Crater Compound was making a remarkable showing and that he was gratified with the result, which meant a saving of the gears, reduction of power loss due to elimination of abrasion and also a reduction in lubricating expense, because it is only necessary to oil the gears twice per day and perhaps not that often.

"When you consider speeds of 60 and 120 R. P. M. for five-hour stretches, operating under terrific heat and the gears and bearings also having steam and water baths, I think we have made a wonderful showing.

"From now on Crater Compound will be their general lubricant throughout the plant on all their gears, and it is not necessary for me to pursue this test further as they are convinced in regard to the merits of Crater Compound."

(Signed) S. S. JACKMAN